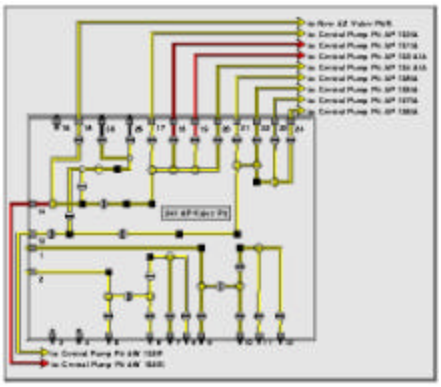
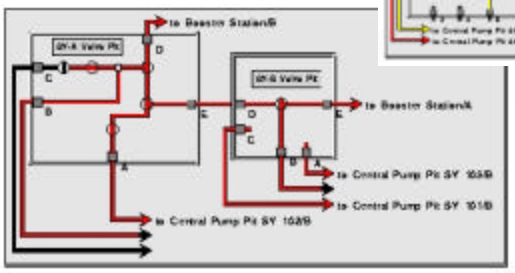
On-Screen Electronic Routing Board

The Challenge

The River Protection Project (RPP) includes 177 single- and double-shell waste tanks, several hundred valve pits, numerous smaller receiver tanks and 50-plus miles of interconnecting piping. This complex piping infrastructure system is arranged to enable waste transfers to and from virtually every tank and Hanford processing facility. The cleanup mission requires a carefully integrated, well-planned sequence of waste feed routes for retrieval, pretreatment, and blending of waste. Various contingency routes also are needed to accommodate possible equipment failures, solids settling or transfer line plugging. There are many common pipe branches used as a partial path for the completion of transfer routes. If one valve is positioned incorrectly, the route will not connect to the desired location. To minimize the possibility of misroutings in this complex piping network, a method of maintaining and showing current valve positions in pump and valve pits is needed.





Examples of actual screen routing schematics available in the HTWOS system.

Current Approach

The traditional method of maintaining current tank routing configurations employs a wall size schematic routing board showing a diagram of all possible routes between tanks. The routing board is kept up-to-date by manually marking routes as they are approved and used. The possibility of routes being used but not correctly illustrated on the routing board are high, and because of the complexity of the actual piping and valving, it is impossible to accurately display all routing information on these routing boards.

Benefits and Features

- Consistently centrally-located real-time database of current route configurations
- Positive control of route changes
- Minimized chance of misroutings
- Automatic configuration control with the best basis tank inventory

New Technology

The Hanford Tank Waste Operations Simulator (HTWOS) is a computer simulator for tank farm operational planning based on initial tank inventories and other operations parameters. The HTWOS models the interaction of all major tank farm activities including 1) operational waste movements to include saltwell pumping activities, 2) low- and high-level feed staging, and 3) privatization phase I and II tank farm activities.

By using a single simulation system to model these activities, interaction of each activity on the other activities is automatically compared to ensure consistency of each operating scenario. Part of HTWOS modeling assumptions includes all tank routes, pump pits, valve pits, and individual valves within the pits. These pump and valve pits, graphically shown on the computer screen, can be interactively displayed.

During this interaction, the lines connecting the valves are shaded to show the path that the pipe contents would take based upon the selected valve positions. This new subroutine modeling feature within HTWOS can be used for real-time electronic tank routing, preserving the current existing routing configuration for all tank farm activities.

HTWOS is an ideal software package for application as a real-time electronic routing board simulator. It can run on a centrally located computer and personnel requiring routing board information can access this centrally running HTWOS from their PC. Users are allowed read-only access displaying the current routing information allowing the user to see the current routing configuration without being able to alter valve positions. Change access would allow the user to modify valve positions creating new tank connecting routes. By accessing the one centrally operated HTWOS, the routing database is always maintained under constant configuration control. Only personnel authorized to make routing changes could, and personnel with read-only privileges could see the current routing configuration and are assured that it really is the current routing configuration.

Demonstration Description

A series of demonstrations were given to several groups within RPP. These groups are responsible for setting up and maintaining routing board configurations until March 1999. The demonstrations showed how the tank routing feature within HTWOS could be used to maintain a consistent real-time database of the current tank routing configuration. The demonstration also revealed how new routes could be displayed by graphically opening and closing valves on pump and valve pit diagrams on the screen.

Demonstration Results

The ability to maintain a consistent real-time database for tank routing information as well as the ability to conveniently access this information from a personal computer was acknowledged by most groups shown the demonstration as a necessary feature to minimize the risk of misrouting. Current tank farm activities are not sufficiently active at this time to justify an electronic routing system, but it was agreed that for upcoming support of feed delivery operations to private vendors this feature will be a necessary and valuable tool.

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Funding for technology demonstration was provided by the U.S. Department of Energy.

Fluor Daniel Hanford, Inc., Technology Management
TM-DEM-99-003